

## **LAND USE EVALUATION of KOCAELI UNIVERSITY MAIN CAMPUS AREA**

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### **Abstract**

Today, Kocaeli University, attending over 20 000 students, has missions such as minimising the unfavourable effects of rapid industrialisation and urbanisation of this region supporting and moreover directing the industry by means of scientific approach and enriching the culture and democratic relation system. Especially, after Kocaeli earthquake August 17<sup>th</sup>, it has been clearly seen the importance of Kocaeli University. Thus, It has been concluded to establish the faculty of architecture and civil engineering, geography, sociology and psychology.

## **Location**

### **Location of Kocaeli City**

Kocaeli City is located in Marmara region. It is 97,345 km far from • stanbul and Ankara respectively. The city has a 1,177,379 population (1997) and ranks first in industry in Marmara region. But, 60% of tax added value is diverted out of the city. Foreign and private capital establishments beginning with liberal economic implications diverted their attention to the region for location because of its proper infrastructure, the implications of government in national industrialisation. So, a great deal of industrial investments has dispersed in the region randomly.

### **Location of Kocaeli University in the City**

Kocaeli University is established in 1992. Parallel to the economical status of Koaceli the vision of University was defined as “a university apt to compete in the international arena, equipped with universal values and institutionalised in all aspects”. Social responsibility of the university was “ to contribute to technological innovation and education in order to improve national potential for international competition”. Today, it has 10 faculties, 12 colleges, 3 institutes, university hospital and various research and implication centres (Figure1). Before the earthquake of August 17<sup>th</sup>, Kocaeli University had approximately 20 000 students, 1150 educational staff and a campus of 650 000 sq per m. Parallel to this reconstruction, to develop physical structure, it had been continued to construct new campus of 600 000 sq. per m. in Arslanbey District, east of Izmit Gulf (figure 1) .

## **August 17<sup>th</sup> Kocaeli Earthquake**

### **Kocaeli City After August 17<sup>th</sup> Earthquake**

Despite industrial development inadequate service development, inequilibrium in sectors due to not supporting agricultural production brought about decrease in life standard and city status. That is because lost in life and property is high in August 17<sup>th</sup> Kocaeli Earthquake.



Figure 1. Kocaeli University Location Plan

### Kocaeli University after August 17<sup>th</sup> earthquake

Most of the buildings of Kocaeli University in Arslanbey, • zmit and Hereke campus areas destroyed and the rest are not suitable for use. As can be seen in table1 total cost of restorate of these buildings is 16 trillion TL. Today, education in Kocaeli University is continuing in 13 different locations in prefabricated buildings. The main reason of this great damage is the lack of master plan.

Building	Building Damage Cost TL	Equipment Damage Cost TL	Total Damage Cost TL
Arslanbey Campus	6,5 trillion	1 trillion	7,5 trillion
Main Campus	1,5 trillion		1,5 trillion
University Hospital	3 trillion	1,5 trillion	4,5 trillion
Hereke Campus	300 billion		300 billion
Köseköy College	650 billion		650 billion
Gölcük College	150 billion		150 billion
• hsaniye College	150 billion		150 billion
Karamürsel College	150 billion		150 billion
Derbent College	50 billion		50 billion

Building	Building Damage Cost TL	Equipment Damage Cost TL	Total Damage Cost TL
Kandıra College	50 billion		50 billion
Health College	250 billion		250 billion
Yeniköy Campus	500 billion		500 billion
TOTAL	13.250 trillion	2.5 trillion	15.750 trillion

Table.1. Economic Losses

### **Reconstruction Of Kocaeli University Main Campus Area**

It should be taken into consideration that location of Kocaeli University is to effect and integrate with the region. It has an important role such as developing relations between academic staff, students and local management and all spatial, economical and cultural organisations. Common programs, which will be driven in reconstruction of each damaged area in the city, new production forms and associations and participation, will create new scientific model for Turkey.

### **Physical Reconstruction**

Kocaeli University needs to define a new and rapid reconstruction to realise centralisation. In this manner, parallel to the efforts to start the education has done some search for a new site for campus area. A land of approximately 600 ha. Most of which is owned by public institutions is selected with the involvement of public and civil institutions and organisations. Engineering geology, Environmental impact analysis, mapping, planning for the selected site was been completed. Architectural design of university buildings is strongly influenced from the vision and mission statements and the corporate image of university.

### **Land Selection**

August 17<sup>th</sup> earthquake left great physical, social and economic damage behind. Improper land selection indicates to select new resident areas. Due to investigations there is a trend to the north of the city in selection of new resident areas. As a result of this, woodland is now in the risk of being new resident areas. Forestry office launched a work for the proper areas considering both land ownership and the selection of new areas, which is next to woodland. In this prospect 5 new areas discussed which listed below (Figure 2) .

- The area of 385,5 ha among Arslanbey -Kabaolu-Üctepeler villages

- [illegible]

Figure 2.Kocaeli Universities New Campus Alternative Areas

### Evaluation of Selected area

## Location

The proposed area which was named Umuttepe is located 5-7 kilometres north of present Kocaeli settlements. It is situated in the Northwest of Ütepelers village in the west of Kabao• lu village, in the east of Eski • stanbul road and in the north west of Akp• nar-Kulfall• villages. There is a new residence area that will be constructed by Turkish Republic Works. Before planning was carried out environmental impact of campus construction was investigated. Some local organisation societies and offices were being mutually comformable.

## Road Network

Campus area is 5 km far from D-100 State road and Centrum via A• aköy –Ar• zl• road. It is 7 km far from Centrum via Üçtepelер –Kabao• lu and 5-5,5 km far from Centrum via Kulfall• -Akp• nar road. Campus area takes side 850 m against Eski • stanbul road

## **Spatial Characteristics**

New campus area lies in the north of the city, in the slopes of Çeneda• between 200 m. and 460 m. Elevations. The maximum rate of flow of A• ao• lu stream is 16 m<sup>3</sup>/s that passes through the campus area. It dries up in the summer because its whole capacity is used for irrigation during this time. A• ao• lu stream excavated its bed to a depth given the morphology a deep valley characters and divides in to two parts. Only 17 ha. Of the area is productive and soil thickness is good for agriculture. The north of the area is exposed to Northwest and west winds all the year. Other directions are exposed to east winds.

The earthquake took place in August 17<sup>th</sup> brought about great disaster due to lower quality and densely urbanisation. For this reason, after the earthquake, geological investigations became an obligatory step for planning and construction purposes. Thus more reliable approaches are now available for these purposes.

In this study, geological mapping of the campus area was carried out, satellite images were evaluated, engineering parameters of soil and rock determined both in-situ and laboratory tests, inclination mapping was carried out and groundwater level determined by means of borehole data.

## **Geology**

The oldest unit, which outcrops in the campus area, is Palaeozoic aged C• narl• dere Formation (Dc) Figure 1. The unit that is composed of shale, slate, and limestone outcrops in Caltarla Tepe, Kabakoz Tepe and Duman S• rt• . The unit represents the transition zone from terrestrial environment to shallow water environment. • zmit Formation overlies this unit unconformably. • zmit formation is composed of Ayval• dere Conglomerate Member (Tria) and Dikenlitepe Sandstone Member (TRid) both of which outcrops in the area. Ayval• dere Conglomerate Member is composed of gravel cemented by sand particles. It is laterally intercalated with Dikenlitepe Sandstone Member, which is composed of interbedded sandstone and mudstone. Campanien-Lütetian aged Akveren Formation (Ktak) is composed of clayey limestone, marl and sandstone. Limestone is observed as plate shaped cracks. The youngest unit in the campus area is Atba• • Formation, which is yellow-brown coloured and is composed of claystone and sandstone.

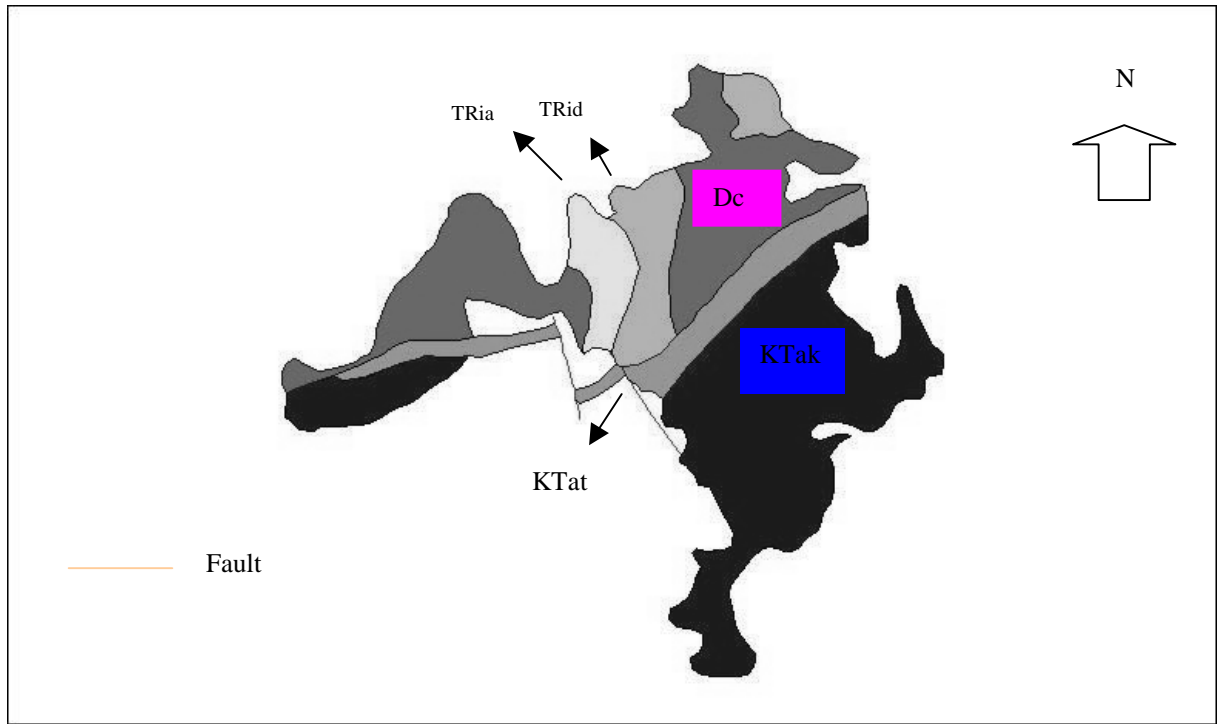


Figure 3. Geology Map (Modified from Çakır, 2000)

### Geotechnical Properties

Some of the geotechnical properties of formation are as follow

Location	Unit Weight $t/m^3$	Uniaxial Strength $kg/cm^2$	Slake Durability	Point Load $kg/cm^2$
SK-1	2,46	340,70		5,66
SK-2	2,45	100	97,60	5,00
SK-3	2,40	106,4		5,32
SK-4	2,63	11,40		18,32

Table 2 Çınarlıdere Formation

Location	Unit Weight $t/m^3$	Uniaxial Strength $kg/cm^2$	Slake Durability	Point Load $kg/cm^2$
SK-7	2,54	340,70		5,95
SK-8	2,59	663,4		33,17

Table 3 Zmit Formation

Location	Unit Weight t/m <sup>3</sup>	Uniaxial Strength kg/cm <sup>2</sup>	Slake Durability	Point Load kg/cm <sup>2</sup>
SK-6	2,42	37,10	98,60	14,32
SK-9	2,62	278,60	99,20	
SK-17	2,65	390,00	99,00	17,32

Table 4 Akveren Formation

Location	Unit Weight t/m <sup>3</sup>	Uniaxial Strength kg/cm <sup>2</sup>	Slake Durability	Point Load kg/cm <sup>2</sup>
SK-5	2,51	74,30		4,00

Table 5 Atba• • Formation

According to Deere and Miller (1966) the core samples taken from boreholes only SK-8 and SK-31 specimens represents medium strength. Others represent very low strength. When swelling, disintegrating and weakening strength taken into consideration due to soaking and drying only SK-2 represents high strength. The others yield very high strength. Taking all these data mentioned above risk evaluation was carried out by means of GIS.

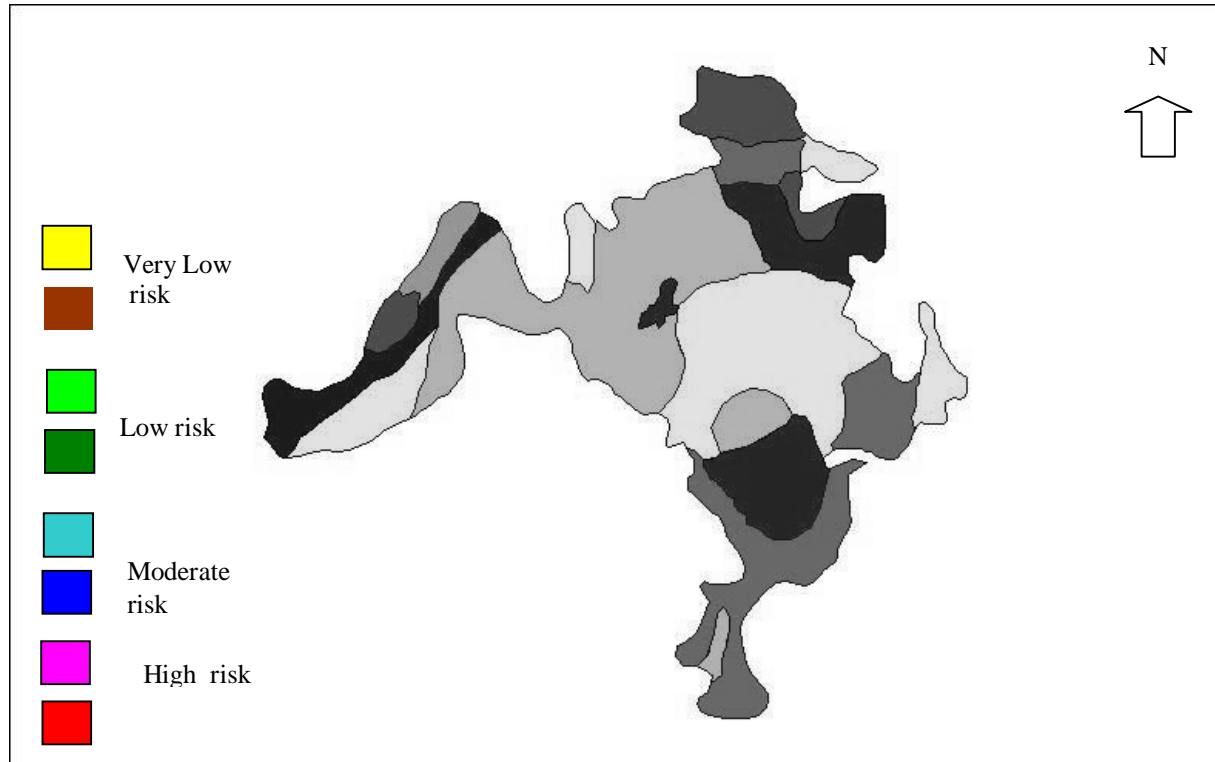


Figure 4. GIS Risk Analysis



## **Spatial Organisation**

### Programs of Campus Reconstruction

- STEP 1- Program to begin to construction in 2000
  - Hospital
  - Administrative Centre
  - Library
  - Conference Centre
  - Remote Education Centre
  - Faculty of Communication
  - Faculty of Engineering
  - Residences
  - Dormitories
  - Social Buildings
  - Infrastructure of this step
- STEP 2- Program to begin to construction in 2001
  - Faculty of Engineering
  - Technical Education Faculty
  - Science-Literature Faculty
  - Education faculty
  - Residences
  - Dormitories
  - Infrastructure of this step
- STEP 3- Program to begin to construction in 2002
  - Faculty of Engineering
  - Institute of Health Science
  - Communication Faculty
  - Economical and Managerial Sciences Faculty
  - Law Faculty
  - Sport and Recreation Buildings

- Infrastructure of this step
- STEP 4- New Faculties and New Development

### **Land Use**

Campus area could be handled in 3 parts.

- East of A• ao• lu stream and its deep valley
- West of A• ao• lu stream and its deep valley
- West of Kulfall• and Ar• zl• Villages

These areas define regions of areas and steps of planning.

#### In Step 1

Planning and location.....: 1 120 000 m<sup>2</sup>  
 Total basement area for buildings: 88 243 m<sup>2</sup>  
 Total building area.....: 242 104 m<sup>2</sup>  
 Max. Floor number.....: 3  
 Land-use... 7,8%

#### **Population**

Number of students.....:	18 000
Number of academic staff.....:	1 270
Number of employee.....:	657
Residents.....:	900
Number of visitors.....:	<u>500</u>
<b>TOTAL</b>	<b>21 330</b>

### **Socio-economic Reconstruction**

Today, Kocaeli University with approximately 20 000 students, 1150 education staff is an important role in Kocaeli city socio-economic life. Its aim is to decrease 50 percent its student capacity.

Turkish Republic due to State Planning Organisation and foreign donation within 3 annual financial program will do all expenditures for the campus reconstruction

## **Administration Reconstruction**

Kocaeli University constructed for the second time within 10 years of its establishment. But this time, not only the university, the whole city is being reconstructed. Now, visional aim is no longer related to the high technologies and being one of the most preferable universities of the world. Within this context, University's visional aims on location are as follows.

- To finish the construction of the hospital and restorate building together with necessary services like dormitory library etc with the finance both from public and private sources
- To finish the construction of the campus together with all support services within 5 years

In the reconstruction of Kocaeli University, to provide the participation of various sectors a decision and advisory board for planning and design were developed.

## **Conclusions**

After August 17<sup>Th</sup> Kocaeli earthquake, Kocaeli University with 20 000 students and 1150 academic staff has begun reconstruct its physical, social, economic and administrative structures

The main reason of this is the lack of master plan.

It is necessary to concentrate the units of University for rational using the foundations and in the design of campus area the spatial characteristics must be examined and monitored.

In the city, it is necessary to develop an vision aim of vision which contact with the city

For rational planning in order to provide the participation from different sectors, a 'Decision Board' an 'Advisory Board', and an ' Advisory Board for Planning and Design' will be developed to utilise every possible source and to obtain maximum efficiency ' transparent management structure'.

As is clearly seen that geological investigation play important role in decision making for planning purposes. It cover only a small part of investigation in planning stage. In some cases it may reach to unrecoverable values as happened in August 17<sup>th</sup>.

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